

**SYSTEM FOR COMPUTATIONALLY EFFICIENT ACTIVE  
CONTROL OF TONAL SOUND OR VIBRATION**

**ABSTRACT**

A noise or vibration control system reduces a sampling rate and reduces a control rate to improve computation efficiency. The present invention permits the use of a sample frequency ( $f_s$ ) that is less than twice the frequency of interest ( $f_d$ ). The sensed signals are filtered to extract a particular frequency range with a lower bound given by  $(2n-1)*f_s/2$  and an upper bound given by  $(2n+1)*f_s/2$ , where  $n$  is an integer chosen so that the frequency of interest ( $f_d$ ) is within the extracted frequency range. The control commands are also calculated at a reduced rate, which is dependent upon the bandwidth of the tone, rather than the absolute frequency of the tone. Rather than updating the control signals directly on the sampled sensor data  $y_k$  as it enters the computer, the control computations are done on the harmonic components  $a_k$  and  $b_k$ , or equivalently on the magnitude and phase.